



Pisgah Marsh Teacher's Packet



Grades 6 - 8



Pisgah Marsh



Wildlife Diversity Section
Division of Fish & Wildlife
402 W. Washington St., W273
Indianapolis, IN 46204

Dear Educator:

Welcome to one of the most diverse locations in Indiana, Pisgah Marsh! The materials within this packet are directed to students grades six through eight. For your convenience, the activities in this packet were developed with the Indiana Academic Standards for Science in mind. In fact, we've even included a table to help you identify specific activities that meet the standards. We hope that you will utilize the materials in the classroom, outside the classroom and even on a field trip to the Pisgah Marsh Boardwalk and Golden Eagle Viewing Deck!

Educational Materials

Your students will learn about arthropods, birds, conservation, geology, herpetology and mammals. Activities vary from class discussion, oral presentations, Internet assignments, creative activities, research assignments and hands-on activities. We hope that we have created a packet that makes adding these topics to your curriculum easier.

Also available is a list of Project WILD activities and their correlation to the Indiana Academic Standards for Science. We've provided you with five sample activities that directly relate to Pisgah Marsh. More information about Indiana's Project WILD is available through the Natural Resources Education Center (NREC) in Indianapolis, IN. (<http://www.IN.gov/dnr/nrec/programs>).

Additionally, we ask that you provide your students with a Pre- and Posttest to measure the effectiveness of these materials. To better evaluate how well we did, we also ask that you report your students' scores to us. This gives us the opportunity to make changes and improve the format in which we provide educational information. Your feedback is also encouraged at this time.

An educational trunk is available for use in the classroom and while on site at Pisgah. For more information about the Pisgah Educational Trunk, please contact the Kosciusko Soil and Water Conservation District at 574-267-5728.

Pisgah Marsh Boardwalk and Golden Eagle Viewing Deck

We encourage you to take your students outside and visit Pisgah Marsh. The Pisgah Marsh Nongame Area is an Indiana hidden treasure. The 135-acre area is nestled on the Kosciusko, Noble and Whitley County lines in Northeast Indiana. The Area is just a short drive south of Tri-County Fish and Wildlife Area in Syracuse and is an ecologically sensitive, geologically significant and biologically diverse area. The boardwalk and viewing deck at the marsh allows students to experience and understand the natural habitat and diversity of the marsh while

5protecting the habitat. Interpretive signs along the boardwalk teach visitors about the property and the large viewing deck provides teachers a location to discuss with students important aspects of the marsh, including the extensive beaver dam.

The boardwalk is approximately .3 miles long and meets ADA standards. An ADA-accessible restroom facility is also available. Bus parking is provided. We encourage practicing and promoting ethical wildlife viewing. Please do not disturb wildlife that is resting, nesting or foraging. In addition, do not litter or feed the wildlife. This is a “carry-in, carry-out” facility.

This area is managed by Tri-County Fish and Wildlife Area. Please report any illegal or damaging activities to this facility at 574-834-4461. Specific questions about these materials or the Boardwalk should be directed to the Nongame Education Specialist at 317-232-4080.

Sincerely yours,

A handwritten signature in black ink, reading "Alisha J. Schiffli". The signature is fluid and cursive, with a large, stylized initial 'A'.

Alisha J. Schiffli
Wildlife Diversity Section
Education Specialist

Pisgah Marsh Educational Materials-Grades 6-8
Indiana's Academic Standards for Science

The Nature of Science and Technology			Scientific Thinking			The Physical Setting			The Living Environment			The Mathematical World					
6th	7th	8th	6th	7th	8th	6th	7th	8th	6th	7th	8th	6th	7th	8th	6th	7th	8th
6.1.2					8.2.7	6.3.16		8.3.6	6.4.1	7.4.2							
6.1.5					8.2.8			8.4.4	6.4.8	7.4.9							
								8.4.8	6.4.9								
									6.4.10								
6.1.5					8.2.7	6.3.15	7.3.3								6.7.2		
						6.3.19	7.3.7										
							7.3.8										
6.1.6		8.1.1	6.2.7						6.4.9	7.4.1							8.7.6
		8.1.8															
6.1.5	7.1.2	8.1.4	6.2.7						6.4.3	7.4.1	8.4.1		7.5.4				8.7.6
	7.1.3								6.4.8	7.4.2							8.7.7
									6.4.9	7.4.8							
6.1.6	7.1.3		6.2.5	7.2.7	8.2.5				6.4.10	7.4.1	8.4.6		7.5.3				8.7.6
			6.2.6		8.2.8						8.4.8		7.5.4				
			6.2.7														
6.1.2	7.1.2	8.1.1	6.2.1	7.2.1	8.2.2				6.4.4	7.4.1	8.4.2		7.5.3	8.5.1		7.7.1	
6.1.5		8.1.3	6.2.2	7.2.2	8.2.3				6.4.8	7.4.5	8.4.3		7.5.4	8.5.4			
		8.1.4	6.2.5	7.2.3	8.2.4						8.4.6			8.5.6			
			6.2.6	7.2.5	8.2.6						8.4.7			8.5.9			
			6.2.8	7.2.6	8.2.7						8.4.8						
				7.2.7	8.2.8												

Activity

Ecology and Diversity:

Hiding Habitats

Geology:

Make your own
Glacier

Arthropods:

Internet Arthropod
Activity

Birds:

Be a Birdwatcher!

Herpetology:

Pisgah Frog and
Toad Field Guide

Mammals:

Recording Mammal
Behavior

INSTRUCTIONS FOR PRE AND POST TESTS

On the next page you will find a 25-question multiple-choice test about information contained in the educational materials. This test will be administered twice. Once before you cover the materials with the students and a second time after you complete the entire Pisgah education unit. Please score the percentage as number of questions answered correctly / 25.

We have provided this test as a measurement tool for the success of the educational materials contained within this packet. We will examine the change in scores between the pre-test and the post-test to determine the effectiveness of the information and activities. This also provides you, the teacher, with the opportunity to express your own personal opinions and experiences you had with the activities. Please submit the information below through regular mail. We ask that you submit the information only once per class and only after the students have taken the posttest.

Mailing Address: Pisgah Test Results
Nongame Education Specialist
Division of Fish & Wildlife
402 W. Washington St., W273
Indianapolis, IN 46204

Results Form

Your name _____

School name _____

Address _____

E-mail _____

Grade being taught _____

Number of students in the class _____

Pretest Results	Number of students scoring	Posttest Results	Number of students scoring
100%	_____	100%	_____
90-99%	_____	90-99%	_____
80-89%	_____	80-89%	_____
70-79%	_____	70-79%	_____
60-69%	_____	60-69%	_____
50-59%	_____	50-59%	_____
40-49%	_____	40-49%	_____
≤ 30%	_____	≤ 30%	_____

Please mail any personal comments with your Results form.

Select the one correct answer for each question below. Write your final answer in the FINAL ANSWERS column to the right.

**FINAL
ANSWERS**

- | | | | |
|---|--|---|--|
| 1. Our current day classification system was created by Swedish botanist _____.
A. Louis Pasteur
B. Carl Linnaeus
C. Marie Curie | 10. If a _____'s tail is broken off, it can grow a new one!
A. Lizard
B. Raccoon
C. Mouse | 19. The body region of an insect with legs and wings.
A. Head
B. Stomach
C. Thorax | 1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____ |
| 2. Stridulation is a way that insects do what?
A. Make sound
B. Eat
C. Swim | 11. An animal that eats insects is called a/an:
A. Carnivore
B. Turtivore
C. Insectivore | 20. Extinction is a _____ process.
A. Strange
B. Natural
C. Dangerous | |
| 3. This type of bird eats other animals.
A. Waterfowl
B. Raptor
C. Migratory Bird | 12. The thin layer of hard white material on the outside of a tooth.
A. Enamel
B. Bone
C. Crust | 21. The series of predictable habitat changes is called _____.
A. Succession
B. Overgrowth
C. Climax | |
| 4. This is the zone that migrating birds in Indiana fly through.
A. Mississippi Flyway
B. Pacific Flyway
C. Indiana Flyway | 13. If you shed your cuticle, you are _____.
A. Shrinking
B. Blending
C. Molting | 22. Birds grouping together is called _____.
A. Herding
B. Flocking
C. Docking | |
| 5. When a species becomes _____ there are no more of its kind living.
A. Extinct
B. Eliminated
C. Threatened | 14. A/An _____ is a long narrow ridge of sand, gravel and boulders.
A. Dune
B. Hill
C. Esker | 23. The study of an animal's behavior is _____.
A. Ethology
B. Herpetology
C. Reptology | |
| 6. These animals are not traditionally hunted for fun or food purposes.
A. Hutable
B. Prime
C. Nongame | 15. _____ is the existence of a wide variety of species in an area.
A. Biodiversity
B. Community
C. Ecology | 24. Another name for a bird's beak is _____.
A. Snout
B. Mouth
C. Mandible | |
| 7. _____ are huge pieces of ice on the earth's surface.
A. Mountains
B. Glaciers
C. Snowcaps | 16. A _____ has hair, a four chambered heart and produces milk.
A. Monolith
B. Mammal
C. Monocot | 25. The name of the marsh in Northeast Indiana is _____.
A. Pisgah
B. Purple
C. Puddle | |
| 8. _____ is built up from dead plant and animals in an area with no oxygen.
A. Sediment
B. Soil
C. Fossil | 17. Birds have _____ bones.
A. Heavy
B. No
C. Light | | |
| 9. _____ is the study of reptiles.
A. Ethology
B. Reptology
C. Herpetology | 18. Animals that are cold-blooded,
A. cannot regulate their body temperature.
B. have cold blood.
C. have blue blood. | | |

Grading Sheet

1. B

2. A

3. B

4. A

5. A

6. C

7. B

8. A

9. C

10. A

11. C

12. A

13. C

14. C

15. A

16. B

17. C

18. A

19. C

20. B

21. A

22. B

23. A

24. C

25. A

Pisgah Marsh Ecology and Biodiversity

Endangered and Threatened Species

Removing a species entirely from a habitat will impact the other species that live there. Unfortunately, biologists cannot predict when the impact will become noticeable.

When a species becomes **extinct**, there are no more of its kind living. Species that are in danger of becoming extinct, throughout all or a portion of its natural range, are classified as **endangered**. If a species is likely to become endangered within the near future in all or a portion of its range, then it is classified as being **threatened**.

It's important to study endangered species because they are linked to environmental quality. They are an early warning system for pollution and environmental problems that may some day affect human health.

Isn't Extinction Natural?

Extinction can and has been a natural process. However, humans have accelerated the process so much that the rate that populations are decreasing can no longer be considered "natural."



What is Biodiversity and Why is it Important?

Biodiversity is the existence of a wide variety of species (plants, insects, animals, microorganisms) in a natural community or habitat. The more diversity that exists, the more variety of things that live in the area. Why is biodiversity important? The primary reason is for the stability of the ecosystem. Plants and animals rely on one another to survive. The removal of a single species can set off a chain reaction affecting many others. The removal of several species can impact the community's ability to recover.

Pisgah Marsh is an area with high biodiversity. There are

many plant and animal species that can be found there. Because the habitat provides a home to several endangered and threatened species, it's very important to try to keep it as natural as possible. The Pisgah Marsh Boardwalk and Golden Eagle Viewing Deck allow us to view the area, experience the rich biodiversity and learn about the unique features of the marsh without damaging the habitat. This project is helping the Wildlife Diversity Section conserve and protect the important habitat and species of the Pisgah Marsh area.

Conservation

Biologists, conservation organizations and individuals around the world are putting in a joint effort to help conserve the environment and the things that live in it. Protecting endangered species and biodiversity saves species that may become important sources of new drugs, medicines or foods.

States and areas with healthy environments attract residents and businesses interested in a good quality of life for their employees and family. Healthy environments also keep a lot of jobs in the area. Unhealthy environments can cost money. For example, loss of wetlands can increase flooding and cost millions in flood losses.

The Wildlife Diversity Section

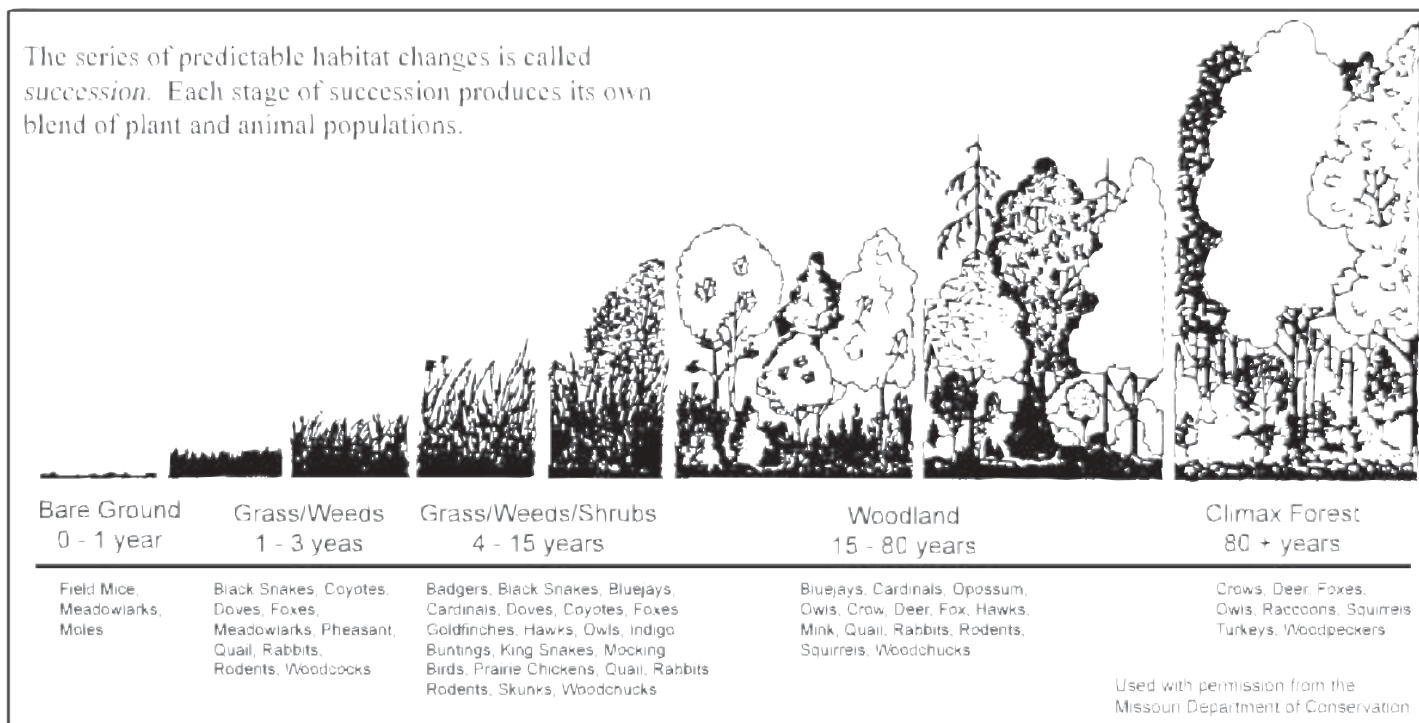
The concept for the Wildlife Diversity Section (WDS) began in 1973 with the passing of the Federal Endangered Species Act. The Act required each state to develop a list of endangered, threatened and special concern species. The WDS's main goal is to protect and manage more than 550 species of nongame and endangered animals in Indiana. These species make up 86 percent of all the wildlife in the state.

Nongame animals are not traditionally pursued for recreational, commercial or food purposes. The WDS has five primary strategies that is used to meet its goal:

Key Terms

biodiversity community
conservation ecosystem
extinction mutation nongame
succession threatened

The series of predictable habitat changes is called **succession**. Each stage of succession produces its own blend of plant and animal populations.



1. Research and surveys
2. Habitat management
3. Public education
4. Restoration projects
5. Land acquisition

Some of the most popular projects of the WDS are: bobcat studies, Indiana Amphibian Monitoring Program, bald eagle reintroduction, development of tern nesting habitat, construction of barn owl nest boxes and the Pisgah Marsh Boardwalk and Golden Eagle Deck project. All of these projects help to manage and conserve Indiana's nongame and endangered wildlife and their habitat.

◀watch: Looking for Ecosystems

A system involving the interactions of living and nonliving elements so that it supports life is called an **ecosystem**. Examples of ecosystem elements are: habitat, community, weather, and such cycles as the nutrient and water cycles.

The living portion of an ecosystem is called the **community**. The community includes all plants, from moss to the largest trees, and all of the animals. A change to any aspect of an ecosystem will impact the entire system. Some changes may have very little affect, while others can have devastating results.

The natural aging or changing process of a community is called **succession**. After an area is disturbed, (either by natural forces such as fire, a tornado or a volcano or by human activities such as plowing, lumbering or grazing) a series of plant and animal communities appears. Each community is gradually replaced by another.

The first community to invade an area after disturbance is called a **pioneer** community. The final, oldest, type of community is a **climax** community. Habitats are made up of different types of communities. The older the community, the more stable it becomes. It can take hundreds of years for a community to actually reach climax stage. Some of the things you might find in a mid-age community are large mammals such as deer and bobcats.

How you Can Help!

Protecting Indiana's wildlife and habitat is not an easy task, and we definitely cannot do it alone! Here is a list of some things you can do to help:

- Learn about endangered wildlife
- Protect habitat such as wetlands
- Don't litter or pollute
- Recycle
- Leave wild animals in the wild. Although they may be cute, they can be dangerous, carry disease and will never be tame like your pet cat or dog.
- Provide habitat in your backyard or property for animals

Classroom Activity

Identify different types of ecosystems with the Hiding Habitats activity.



Wildlife Diversity Section
402 W. Washington St., W273
Indianapolis, IN 46204
317-232-4080
www.wildlife.IN.gov

Hiding Habitats

OBJECTIVES:

Students will understand the following:

1. Learn to identify different types of habitats.
2. Identify characteristics that distinguish habitats from one another such as: types of plants and animals visible.
3. Learn how direct observation can be used for scientific purposes.

MATERIALS:

Photographs of habitats at different levels of succession.

PROCEDURE:

1. Review with your students different levels of succession and key identifying features of each.
2. Talk with students about the benefits of having multiple types of habitats and the effects such things as trees falling, fire and humans can have on a habitat.
3. Tell your students that they will be required to find three different habitats and write down the key features that helped them to distinguish between the three.
4. Students will also be required to draw their habitats using colored pencil and identify the key features. They will also write a few sentences explaining the habitat.
5. You may require students to give a brief presentation to the class to talk about the habitats they found.

ADAPTATIONS:

Adaptations for Older Students:

Collect samples of some of the key identifiers of the habitat and construct a poster explaining the three habitats they found and why they identified them as such.

DISCUSSION QUESTIONS:

1. What impacts can people cutting trees or tall weeds have on a habitat?
2. Smokey Bear was created to prevent forest fires. However, since that time, it has been determined that fire is very important to help older forests grow. What are the positive and negative impacts that fire can have on a community?
3. How do students feel about people using land for recreation even though it could destroy it?
4. What types of things can they do to help provide habitat for animals?

EVALUATION:

You can evaluate your students on their sketches and paragraphs using the following three-point rubric:

Three points: sketches carefully and accurately depict vegetation types and sizes; paragraphs clear, complete, and error-free

Two points: sketches adequate; paragraphs sufficiently clear, but with some errors

One point: sketches adequate; paragraphs lacking in clarity with numerous errors

You can ask your students to contribute to the assessment rubric by determining what information the report should provide.



Pisgah Marsh Geology



Eskers are quite common in Alaska.

What makes Pisgah Special?

The Pisgah Marsh Boardwalk is located in a very interesting geological area. Besides being located near a marsh and a lake, the Pisgah Boardwalk was built on top of an esker. An **esker** is a long narrow ridge of sand, gravel and boulders deposited by a stream flowing beneath a glacier.

Although they've been here for hundreds of years, eskers are not widely known in Indiana.

Glacier Quick Facts

Presently, ten percent of land area is covered with glaciers.

During the last Ice Age, glaciers covered 32 percent of the total land area on earth.

Glacier ice crystals can grow to be as large as baseballs.

Almost 90 percent of an iceberg is below water - only about ten percent shows above water.

Antarctic ice is over 4,200 meters thick in some areas.

North America's longest glacier is the Bering Glacier in Alaska, measuring 204 kilometers long.

What Makes an Esker, an Esker?

The formation of an esker takes a very long time. To understand the process, there are several key terms that you must know.

clay- a texture of sediment. It is so fine that it is too small

to be seen by the eye. Clay feels waxy when combined with water. Clay can also be molded and hold its shape.

glacial till- an unsorted mixture of clay, silt, sand, gravel and boulders deposited at the bottom of the glacier. Just about anything in the path of a glacier will get stuck in the ice and 'picked up.' As the glacier slowly moves, it leaves a debris-rich layer behind.

meltwater- melted ice from the glacier. The water accumulates in lakes in front or underneath a glacier or exits in front or on the side through streams.

meltwater channel- as meltwater runs off the glacier or runs through cracks, large tunnels form and carry the water away from the glacier

organic sediment, muck or peat- types of soil. Material that builds up from dead plant and animals in an environment that does not have oxygen. If oxygen were present, the material would decay leaving no trace behind. You may even find things such as leaves or tree needles in muck.

Eskers are made up of very rocky debris left behind from the glacier. At times, below the rocks, a layer of clay is formed. The clay forms a barrier and is able to keep water from soaking into it.



This photo shows the top of the Pisgah Marsh esker. Notice the slope of the hill on both sides.

Key Terms

clay esker glacial till
meltwater meltwater channel
organic sediment tunnel

How is an Esker Formed?

Because of changing air temperatures, glaciers are always changing shape. They constantly freeze, melt and refreeze. As water freezes it expands and takes up more space. This constant change causes glaciers to move.

Stage 1:

The glacier lays down a mixture of clay, silt, sand and gravel beneath it to make glacial till. The glacial till beneath Pisgah Marsh has a lot of clay which blocks water from passing through the soil.

Stage 2:

Melting ice near the bottom of the glacier causes tunnels to form. The tunnels carry the meltwater to the edge of the glacier.

Stage 3:

Tunnels widen, shrink, open and close because the ice is always freezing, melting and moving. As water flows through the tunnels on top of the ground, depressions and groves are cut into the glacial till.

Stage 4:

The glacier begins to stagnate or melt in place.

Stage 5:

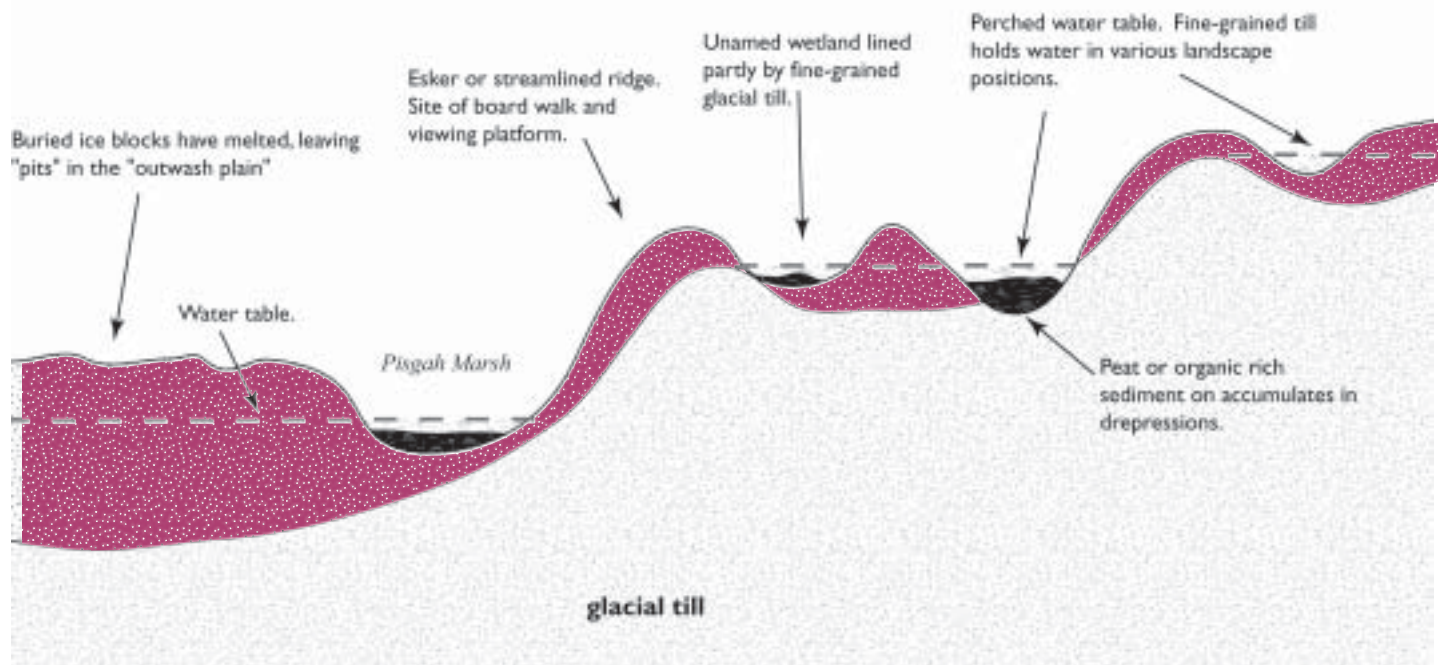
Meltwater begins to collect on top of the glacier and flows to tunnels through cracks and crevasses in the ice. Rivers can even form on top of the ice.

Stage 6:

Just like the rivers and streams we see today, sand and gravel is deposited on the ground as the speed of the meltwater river slows down. The sediment, sand, gravel and rocks left behind, builds up in the tunnel and becomes an esker.

Stage 7:

As the glacier continues to melt, the roof of the tunnel collapses. Large blocks of ice get buried in the sediment and may take years to melt. Large holes are left in the ground where the blocks have melted. Because some of these holes are below the water table, they become lakes and ponds.



Classroom Activity

Make your own glacier and see its affects on the landscape. See the Make Your Own Glacier activity sheet for instructions.



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402 W. Washington St., W273
Indianapolis, IN 46204
317-232-4080
www.wildlife.IN.gov

Make your own Glacier

Adapted from Frank Wisel, Tilden Middle School, Rockville, Maryland.

OBJECTIVES:

Students will understand the following:

1. As glaciers move, they create a variety of patterns on landforms by a process called *glacial scraping*.
2. The scraping patterns left by a glacier depend on how the glacier moved over the landform.
3. The evidence of glaciation left by glacial scraping provides clues to the climate in a particular place over a long period of time.

MATERIALS:

You will need access to a freezer. Photographs of glacial-scraping patterns would enhance the lesson. In addition, the following materials should be available for each group:

9 oz. Plastic cup (solo party cups recommended)
Sand
Angular gravel
Limestone rocks
Tap water
Plastic wrap
Tape
Paper plates or cookie sheet
Paper towels or hand towels
Rubber medical gloves

PROCEDURE:

1. Review with your students what they have learned about glaciers. They should be able to define *glacier* and explain why glaciers move over landforms.
2. Ask students how they think scientists can tell if glaciers have moved over the land in a particular area. Explain that rocks and gravel freeze into the ice and are dragged over the land by the bottom surface of a glacier. How would the land over which a glacier has moved be affected? What evidence of glaciation do glaciers leave behind?
3. Tell your students that they will participate in an activity that will simulate the way landforms are affected by glaciation.
4. Divide the class into groups, and have each group create its own miniature glacier. One group will make a glacier with just water, one with sand, one with the angular gravel and one with the limestone rock.
 - Have students fill one-third of a cup with either, sand, gravel or rocks.
 - Fill the cup the rest of the way up with water to about one quarter of an inch from the top of the cup.

- Securely tape plastic wrap over the top of the cup.
- Flip the cup upside down onto a paper plate or cookie sheet.
- Leave the inverted cup in a freezer overnight.

5. When the “glaciers” are frozen solid, have students peel off the plastic wrap. Take the students outside to an area of dried soil. You may need to warm the cup in your hands to get the ice to fall out of the cup. You may even want to do an area with other rocks or grass to show how the landscape can be affected. Have the students cover their hands with the gloves (this will help keep them dry) and scrape them, gravel end down, over the soil. To simulate the action of a glacier, students should scrape in only one direction, since glaciers move only one way.

6. Ask students to observe the patterns the gravel has made on the soil. How would they compare these to the patterns made on landforms by a real glacier? (If possible, provide photographs of actual glacial scraping.) What are the different affects made by the different types of glaciers?

7. Have each student sketch their patterns and write a short paragraph explaining what they can infer about the way real glaciers affect the landforms over which they move.

8. Discuss with the class how patterns of glaciation provide clues to the climate in a particular area over time. For example, if evidence of glacial scraping is found in an area that is too warm for glaciers to exist, what can we infer about how the climate in that area has changed over a long period of time?

ADAPTATIONS:

Adaptations for Older Students:

Have students research different kinds of glaciers and the ways in which they move.

DISCUSSION QUESTIONS:

1. Speculate why icebergs are so hard to destroy. List your reasons.
2. Water expands when it freezes. This is the underlying reason why an iceberg floats—it is less dense than water. So, why does the amount of underwater ice in an iceberg vary?
3. If you were a ship’s captain and had to sail into iceberg-infested waters, what precautions would you take?
4. Speculate whether icebergs could be used constructively as a resource for freshwater.
5. Discuss thermohaline circulation and its global effects.
6. Analyze the global effects of the current annual increase in icebergs. Relate the analysis to present-day processes.

EVALUATION:

You can evaluate your students on their sketches and paragraphs using the following three-point rubric:

Three points:sketches carefully and accurately drawn; paragraphs clear, complete, and error-free

Two points:sketches adequate; paragraphs sufficiently clear, but with some errors

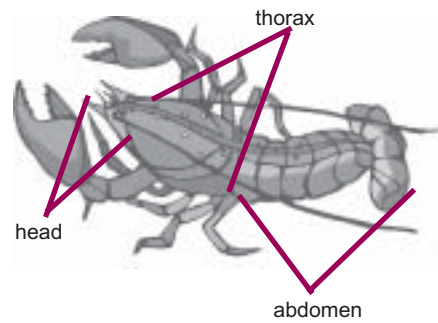
One point:sketches adequate; paragraphs lacking in clarity with numerous errors

You can ask your students to contribute to the assessment rubric by determining what information the report should provide.

Pisgah Marsh Arthropods

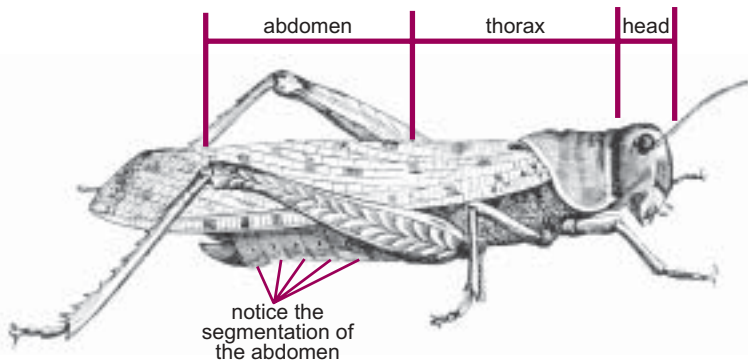
What's an Arthropod?

There are more than one million different **Arthropod** species. They live in marine, freshwater and terrestrial habitats worldwide. They have an **exoskeleton**, jointed limbs and segmented bodies. In order to grow, Arthropods must **molt**, or shed their cuticle. Certain body parts may be modified slightly as mouthparts, limbs, wings, reproductive organs or sense organs. Some examples of Arthropoda: spider, butterfly, dragon fly and crayfish.



Arthropod Anatomy

Arthropods are **invertebrates**, which means that they do not have a back bone. Although certain body parts may be modified, they all have three distinct body sections: **head**, **thorax** and **abdomen**.



Key Arthropod Definitions:

abdomen- the posterior end, often elongated on Arthropods. The abdomen of insects and crustaceans is typically segmented. Whereas, arachnids are unsegmented.

exoskeleton- a skeleton on the outside of the body. The tough outer layer on an arthropod. In order for Arthropods to grow, they must shed their exoskeleton and grow a bigger one.

head- the part of the body bearing the eyes, antennae and mouth parts.

molt- the process of shedding. Arthropods frequently molt their exoskeletons so they can grow.

thorax- the body region behind the head that bears the legs and wings.

Critter Classification

In order to effectively study plants and animals, all scientists need to use the same names. Using the same names keeps scientists from getting confused about what species is being referred to. Our current day classification system was created by Swedish botanist Carl Linnaeus in 1757; this is what we refer to as **taxonomy**.

People that are not scientists use common names. For example, one of the most common grasshoppers in Indiana is known by two names: 1) Most people call them by their common name: "red-legged grasshopper" while 2) Scientists use the grasshopper's scientific name: *Melanoplus femurrubrum*.

Scientific names utilize binomial nomenclature, which means two-part name. The scientific name is considered the genus and species name for the organism. Taxonomic classification uses a seven-level system. These levels are:

Kingdom
Phylum
Class
Order
Family
Genus
species

Notice that the words 'Genus' and 'species' are in italics. The scientific name for an organism is always written this way with the first letter of the Genus capitalized. If the Genus and species are handwritten, we underline them.

Key Terms

arthropod exoskeleton head
invertebrate molt taxonomy
thorax

Let's take a look at the taxonomic classification for the red-legged grasshopper.

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Orthoptera
Family	Acrididae
Genus	<i>Melanoplus</i>
species	<i>femurrubrum</i>

Do you Hear What I Hear?

Insects are the dominant group of animals on the earth today. They far surpass all other terrestrial animals in numbers and occur practically everywhere. Some authorities believe that there may be close to 30 million different kinds!

Some of the most interesting behavior in insects occurs in relation to sound. The sounds produced by many insects are either very soft or very high pitched and are seldom, if ever, heard by humans. The primary role played by sound in many insects is to bring the sexes together. The common song of the male attracts the female. In a few cases, the singing of the male may cause the female to produce a sound that enables the male to locate her.

There are six primary ways that insects produce sounds:

1. **stridulation:** this involves the rubbing of one body part against another. One part is generally sharp-edged, and the other is more or less filelike. Some of the best known singers (male crickets and long-horned grasshoppers) stridulate with the two front wings.
2. **tymbal vibration:** the tymbals are membrane-like structures that are moved by muscles - somewhat like moving the end of a tin can in and out.
3. **substrate striking:** Some insects tap or drum on the ground or material on which they are standing with their head, feet or abdomen.
4. **ejecting air or liquid:** this method is relatively rare in insects. The expulsion of air to produce vocal sounds is the common method of sound production in mammals, birds and some other vertebrates.
5. **wing vibration:** the wing movements of most insects produce a humming or a buzzing sound, but in some cases the thorax is also involved in this sound. A bumble bee held by the wings will still buzz by vibrations of the thorax.

6. **movement or feeding:** some insects when they run about on certain surfaces may produce an audible sound. Most feeding by insects produces such weak sounds that they are scarcely or not at all audible.

Crustacean Arthropods

Crustaceans are gill-breathing arthropods with two pairs of antennae and two pairs of maxillae on the head and usually a pair of appendages on each body segment. Maxillae are mouth parts used during eating. Common crustaceans are lobsters, crayfishes and shrimp.

The crayfish, also known as crawfish, crawdad or mudbug, is found in freshwater streams and ponds all over the world. There are about 350 species of crayfish in the United States. Unfortunately, very little is actually known about the crayfish that live in Indiana.

Crayfish eat all kinds of aquatic vegetation and on animal foods such as snails, worms and small vertebrates. Crayfish can survive in almost any type of freshwater habitat. There are at least two different species of crayfish found in the Pisgah Marsh area. Crayfish should never be reintroduced into habitats where they are not naturally found. The Wildlife Diversity Section is doing research to learn more about the crayfish that live in Indiana.

Arthropods at Pisgah

You may find many different Arthropods while visiting Pisgah Marsh. Most of them will remain unseen, however you will definitely know they are there! Arthropods make many different sounds.

Classroom Activity

Scientists continually debate the taxonomic classification of organisms. The Internet Arthropod Activity allows you to search for plants and animals to learn taxonomic information about them.



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www.wildlife.IN.gov

Information provided by the Indiana Division of Entomology and Plant Pathology and *An Introduction to the Study of Insects, Sixth Edition* by Borror, Triplehorn and Johnson (1989)



Pisgah Marsh Arthropods

Activity Sheet

Internet Arthropod Activity

OBJECTIVES:

Students will understand the following:

1. Learn the conservation status, taxonomic, and distribution information for animal species living at Pisgah Marsh.
2. Learn how to utilize the Internet as an effective research tool.
3. Learn how to write a basic laboratory report and give a presentation on findings to class.

MATERIALS:

Access to the Internet
Pencil
Internet Arthropod Worksheet
Paper

PROCEDURE:

1. Review with your students what they have learned about taxonomic classification. Explain to students that scientists continually do research and debate taxonomy.
2. Discuss with your students the purpose of laboratory reports and their importance.
3. Tell your students that they will participate in an activity that will allow them to use the Internet as a valid reference, how to look up taxonomic information about animals living at Pisgah Marsh, write up a laboratory report about what they learned and share their findings with other students.
4. This activity will utilize NatureServe Explorer: an online encyclopedia of life. NatureServe Explorer is a source for authoritative conservation information on more than 50,000 plants, animals, and ecological communities of the United States and Canada. NatureServe Explorer provides in-depth information on rare and endangered species, but includes common plants and animals too. NatureServe Explorer is a product of NatureServe and its network of natural heritage programs.
5. Included in this packet is a worksheet to be photocopied and given to each student. Answers for this worksheet are on the back of these instructions.
6. After the students have completed the worksheet, have them give a brief presentation to the class about their findings.

ADAPTATIONS:

Adaptations for Older Students:

Have the students find a study on the species they selected in a refereed scholarly biological journal and report their findings to the class.

Pisgah Marsh Arthropoda: Using NatureServe Answer Sheet

Answers:

Point Value: 50 pts. total

1A. The buckmoth	1
1B. northeastern	1
2A. <i>Cambarus ortmanni</i>	2
2B. S2: imperiled	1
3A.	
Kingdom: Animalia	1
Phylum: Mandibulata	1
Class: Insecta	1
Order: Orthoptera	1
Family: Acrididae	1
Genus: <i>Melanoplus</i>	1
species: <i>femurrubrum</i>	1
4A. <i>Ageleopsis naevia</i>	2
4B. Webs may be up to 3 feet.	1
Kaston	1
1972	1
5A. No species match your search	1
6A. Dragonfly or damselfly	1
6B. <i>Aeshna verticalis</i>	2
7. Species found in Indiana:	29
<i>Batrachus cellulanus</i>	
<i>Batrachus mucronatus</i>	
<i>Crangonyx anomalus</i> ; ANOMALOUS SPRING AMPHIPOD	
<i>Crangonyx forbesi</i> ; A CAVE AMPHIPOD	
<i>Crangonyx gracilis</i> ; BIG WHITE AMPHIPOD	
<i>Crangonyx minor</i> ; MINOR CAVE AMPHIPOD	
<i>Crangonyx packardii</i> ; PACKARD'S CAVE AMPHIPOD	
<i>Crangonyx</i> sp. 1	
<i>Gammarus bousfieldi</i> ; BOUSFIELD'S AMPHIPOD	
<i>Stygobromus mackini</i> ; SOUTHWESTERN VIRGINIA CAVE AMPHIPOD	
<i>Stygobromus</i> sp. 2	
<i>Synurella dentata</i>	
<i>Cambarus diogenes</i> ; DEVIL CRAWFISH	
<i>Cambarus laevis</i> ; A CRAYFISH	
<i>Cambarus ornatus</i> ; A CRAYFISH	
<i>Cambarus ortmanni</i> ; BURROWING CRAYFISH	
<i>Cambarus robustus</i> ; A CRAYFISH	
<i>Fallicambarus fodiens</i> ; A CRAYFISH	

This question should be graded on how well the student follows instructions, if the student selected the correct animal; if the student followed correct taxonomic classification rules (genus and species is underlined); how well the student does at giving the oral report (spoke loud enough, slow enough etc.).

Pisgah Marsh Arthropods: Using NatureServe

50 pts.

Name _____

INSTRUCTIONS:

Using either Internet Explorer or Netscape Communicator go to <http://www.natureserve.org/explorer>

You will look up different animal species that are found at Pisgah Marsh and answer specific questions about their taxonomic classification and distribution. You will be searching by "Plants and Animals" to find this information. All of the answers can be found within the "Comprehensive Report" for the species.

1. Search for *Hemileuca maia*.

A. What is the common name for this species? _____

B. This species is listed as endangered or threatened in several _____ states. _____

2. Search for burrowing crayfish.

A. Find the species found in Indiana. What is its scientific name? _____

B. What is this animal's state conservation status rank in Indiana? _____

3. Search for red legged grasshopper.

A. Find the species found in IL, MI and MO. What is its taxonomic classification?

Kingdom	Phylum	Class	Order	Family	Genus	species

4. Search for grass spider.

A. Find the species found in Indiana. What is its scientific name? _____

B. What comments are made on this species ecology? Who made them and when? _____

5. Search for dragonfly.

A. What species name does it find? _____

6. Search for darner.

A. What is a green-striped darner? _____

B. What is this animal's scientific name? _____

7. Do a Group Search for crustacean and add the search criteria for Location.

Find an animal that can be found in Indiana. On separate paper, write up a brief report on this animal using the information in the comprehensive report. You should have a description of the animal; a drawing, sketch or photo; Scientific classification. You may also be expected to give a brief in-class presentation on your findings.

Pisgah Marsh Birds

Birds of a Feather Flock Together

Pisgah Marsh is a hot spot for many species of birds. Throughout the year, nearly 200 different types of birds may be found in the area. These include: songbirds, waterfowl, raptors, migratory birds and wading birds.

Why do birds flock together? Flocking occurs when groups, small and large, of birds huddle or stay close together. Birds will flock depending on several key factors: location, time of day, season and amount of food.

Younger birds may follow older birds to find good food sources. Instead of staying out in the open by themselves, some birds will flock to protect themselves from predators. It has even been discovered that an entire flock of birds may group together to attack predators.



Sandhill cranes are migratory wading birds. Artwork by Jennifer Idle



A flock of migrating sandhill cranes.

Other birds may flock during migration. Certain species of birds must learn from older family members their yearly migration route. In cold temperatures some birds flock to keep each other warm. The biggest reason, says biologist W.D. Hamilton, that animals are found in flocks, herds or schools, is because they are selfish. Each bird only thinks of protecting itself, feeding itself or staying warm.

Many animals will group together for different reasons. Some larger animals will actually group together to help protect the youngest members of the family. No matter what the exact reason, it always comes down to the key aspect of survival!

migratory bird - a bird that moves from one region or climate to another, often in response to seasonal changes; also includes some species of songbirds, waterfowl and wading birds. Examples: hummingbird, blue jay, mallard and robin

raptor - a bird that preys on other animals. Examples: hawk, owl and falcon

wading bird - long-legged birds that wade in water in search of food. Examples: crane, heron, bittern, sandpiper and egret

waterfowl - a bird that frequently visits water or lives near rivers or lakes or on or near the ocean. Examples: duck, goose and swan

Bugs, Berries or Birds?

The shape of a bird's bill can tell you a lot about what the bird eats. Is it small and fine like a warbler? Stout and short like a sparrow? Dagger-shaped like a tern or hook-tipped like a raptor? Can you guess what each of the birds' bills below is designed for eating?

This bill is small and fine. The Eastern blue bird uses its bill to catch insects and will primarily feed on berries in the winter.

EASTERN BLUE BIRD



This bill is stout and short. The House finch uses its bill to crack nuts and seeds. Their diet consists primarily of seeds, but they also eat fruit, leafy vegetation, insects and nectar.

HOUSE FINCH



This bill is narrow and dagger-shaped. Great egrets are most encountered wading in open wetlands and shallow water searching for small fish, amphibians and aquatic invertebrates.

EGRET



This bill is sharp and hook-tipped. Hawks use their bills to prey on medium-sized birds and mammals such as squirrels and chipmunks.

COOPERS HAWK



Key Terms

flock

migratory

raptor

wading bird waterfowl

Migration Time!

Animals, birds included, may migrate during different times of the year. Migration is the two-way or “round-trip” movement of animals from a given area to another, usually along well-defined routes. Migratory movement is usually triggered by seasonal or other factors (e.g. changing day-length).

Different species will migrate at different times of the year. Because of this, there are nearly 200 different species that could be seen at Pisgah Marsh. Some species live most of the year at Pisgah while some others will only visit.

Residents of the marsh may migrate south when it gets cold. Leaving to go to another location or “moving out” is called **emigration**. There are also some species that will migrate to Pisgah Marsh for only a limited time and then return to their original habitat for the rest of the year. Moving into an area is called **immigration**.

Emigrate and immigrate are both “one-way” movements. In simpler terms, the birds are either coming or going to a different location temporarily. Permanent residents are birds that stay in one area year round, thus they don’t move at all.

Migratory Bird Protection

The Migratory Bird Treaty Act was developed in an era when people decorated their hats with exotic bird feathers and signed their letters with pelican-quill pens. Because there were no hunting regulations, it was common to find large numbers of ducks, geese and other birds for sale at local markets.



Women, like Louise Jackson, in the early 1900s would exhibit their wealth with extravagant bird feathers.

In 1912 the Audubon Society initiated a boycott against hat makers that imported feathers from rare species of birds. At the same time, sport hunters began pushing for a law that would unify state hunting regulations.

In 1913, Congress passed the Migratory Bird Act to regulate hunting. Later that year, the Weeks-McLean Act gave the Secretary of Agriculture the power to regulate waterfowl hunting seasons; and the spring hunting and marketing of birds became prohibited.

Also that year, William T. Hornaday, head of New York Zoological Society wrote “Our Vanishing Wildlife, Its

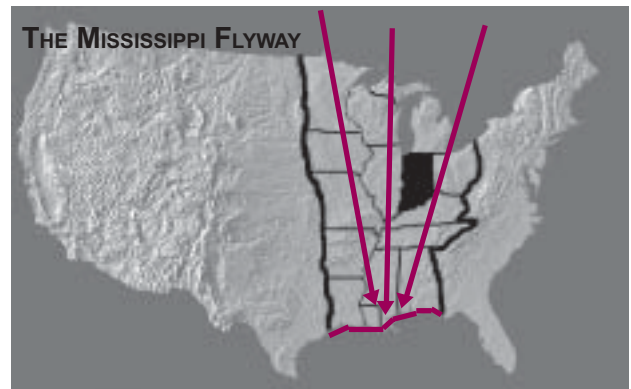
Extinction and Preservation.” By 1914, he helped establish the Permanent Wildlife Protection Fund with grants from Andrew Carnegie, Henry Ford and George Eastman.

In 1916, the United States and Great Britain (on behalf of Canada) adopted a system of protection for certain species of birds which migrate between the United States and Canada.

July 3, 1918 the Migratory Bird Treaty Act was signed with Canada and regulations from the Migratory Bird Act. The Act made it illegal for people to “take” migratory birds, their eggs, feathers or nests. Take is defined as “any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg or part thereof. In total, 836 bird species are protected by the Act, 58 of which are currently legally hunted as game birds.

Fly Away Home

Birds around the world have areas or zones through which they fly to reach their destination. These zones are called flyways. The birds that pass through Indiana are in the Mississippi Flyway. Some birds will migrate very long distances, across countries and even continents!



Classroom Activity

Grab your binoculars and head on out. Learn how to identify birds with the Be a Birdwatcher! activity. See Activity sheet to see how.



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Information provided by *The Birder's Handbook: A Field Guide to the Natural History of North American Birds* by Ehrlich, Dobkin and Wheye, New York: Simon & Schuster Inc (1988). “Louise Jackson” Photo: Library of Congress, Prints and Photographs Division, Detroit Publishing Company Collection.

Be a Birdwatcher!

OBJECTIVES:

Students will understand the following:

1. How to utilize a field guide to identify species.
2. Understand how observation is a valid scientific research method and how to collect data.
3. Learn how to utilize a seasonal species list.

MATERIALS:

Binoculars
Paper for note taking
Pisgah Marsh Seasonal Bird List
Pen or pencil
Clipboard or hard surface on which to write
Bird field guide

PROCEDURE:

1. Review with your students what they have learned about birds and migration.
2. Discuss with your students that scientists will sometimes collect data through direct observation. They may keep track of the things they see at a certain point in time.
3. Show students how to read and use the seasonal bird list. Explain that because of migration, birds may not be found at a location year round.
4. Explain to your students that they will participate in a group scientific study of birds found at Pisgah Marsh.
5. Put students in groups of three.
6. One student will first serve as the recorder and will write down the data. The second student will first serve as the observer and, using the binoculars, report what birds he or she sees. The third student will assist with positive identification of the birds seen with usage of the field guide and bird list.
7. Each student will hold their 'job' for ten minutes and be instructed to rotate positions within the group. By the end of the 30-minute time-frame, each student should have completed all three responsibilities.
8. Give each group a copy of the Instructions sheet. Explain the activity with your students.

ADAPTATIONS:

Adaptations for Older Students:

Put students in smaller groups or require the assignment to be an individual take-home assignment. Students can be asked to monitor for 15 minutes.

DISCUSSION QUESTIONS:

1. Thinking of migration, why is it important that the United States works with other countries to protect birds?
2. Discuss the different activities that could have led to the decline in bird populations.
3. What types of birds have the students seen flying in flocks and speculate why they might be doing so.
4. Discuss current uses of different birds.

EVALUATION:

You can evaluate your students on their ability to work in a group. Ability to follow directions. Completeness of work and attention to detail.

Pisgah Marsh Birds

Activity Sheet

Be a Birdwatcher!

MATERIALS:

Binoculars
2 sheets of notebook paper
pen or pencil
clip board
Pisgah Marsh Seasonal Bird Checklist
field guide on birds

Biologists who study birds are called ornithologists. In this activity you will have the opportunity to study birds, identify them, get a second opinion and use observational research. Bird lists are created based on the birds that are found in a specific location.

The DNR's ornithologist observes locations over a length of time. The bird list has already been developed for Pisgah Marsh. You will use the bird list to help identify species that you see while you are there.

Make sure you pay attention to the shape of the beak, coloring, size and shape of the tail feathers to help you identify the birds. Listening for their call may also help.

Please remember to use appropriate wildlife watching behavior while on assignment. Do not disturb wildlife that is resting, nesting or browsing. Do not litter or feed the animals.

Ok, we should be ready now, so, let's grab our binoculars and head out to the field!

DIRECTIONS:

You will watch for, identify and record any birds that you see within a 30-minute time period. Write down any notes that helped you to identify the bird. If you are unable to identify the bird, be sure to record as much information about what you saw and heard so that you can identify it at a later time.

There are three different bird watcher responsibilities. Each member in the group will choose only one responsibility to perform at a time. One member will be the recorder, one member will be the observer and one member will be the second opinion. It does not matter which responsibility you choose first, you will have the opportunity to do all of the responsibilities.

You will hold the position of each responsibility for 10

minutes. After the first ten minutes are up, you'll change responsibilities and do something new. You will now perform your new responsibility for 10 minutes. After the second ten-minute period is up, you'll perform the last responsibility. Again, you'll be completing it for 10 minutes.

BIRD WATCHER RESPONSIBILITIES:

1. Recorder
2. Observer
3. Second opinion

Recorder: The recorder will need the clipboard, pen or pencil and note paper. It is your responsibility to write down any information that the other two members in your group tell you.

Record information such as:

- beak shape
- color
- size
- sound
- what it was doing
- name/type of bird
- information about tail
- any other information about the bird

Observer: The observer will need the binoculars and need to have their eyes and ears open. It is the observer's job to find the birds and report to the recorder what you see and hear. If you know what kind of bird it is, you may also have the recorder write that information down. You will try to identify and report information about as many birds as you can within the 10-minute time frame.

Second Opinion: Biologists and scientists will often get help in completing their research. Sometimes they will get a second opinion from another biologist or scientist. The second opinion will need the bird field guide and the Pisgah Marsh Bird Checklist. It is the second opinion's responsibility to assist the observer in accurately identifying the birds. Don't worry if you cannot do it within the 10-minute time frame.

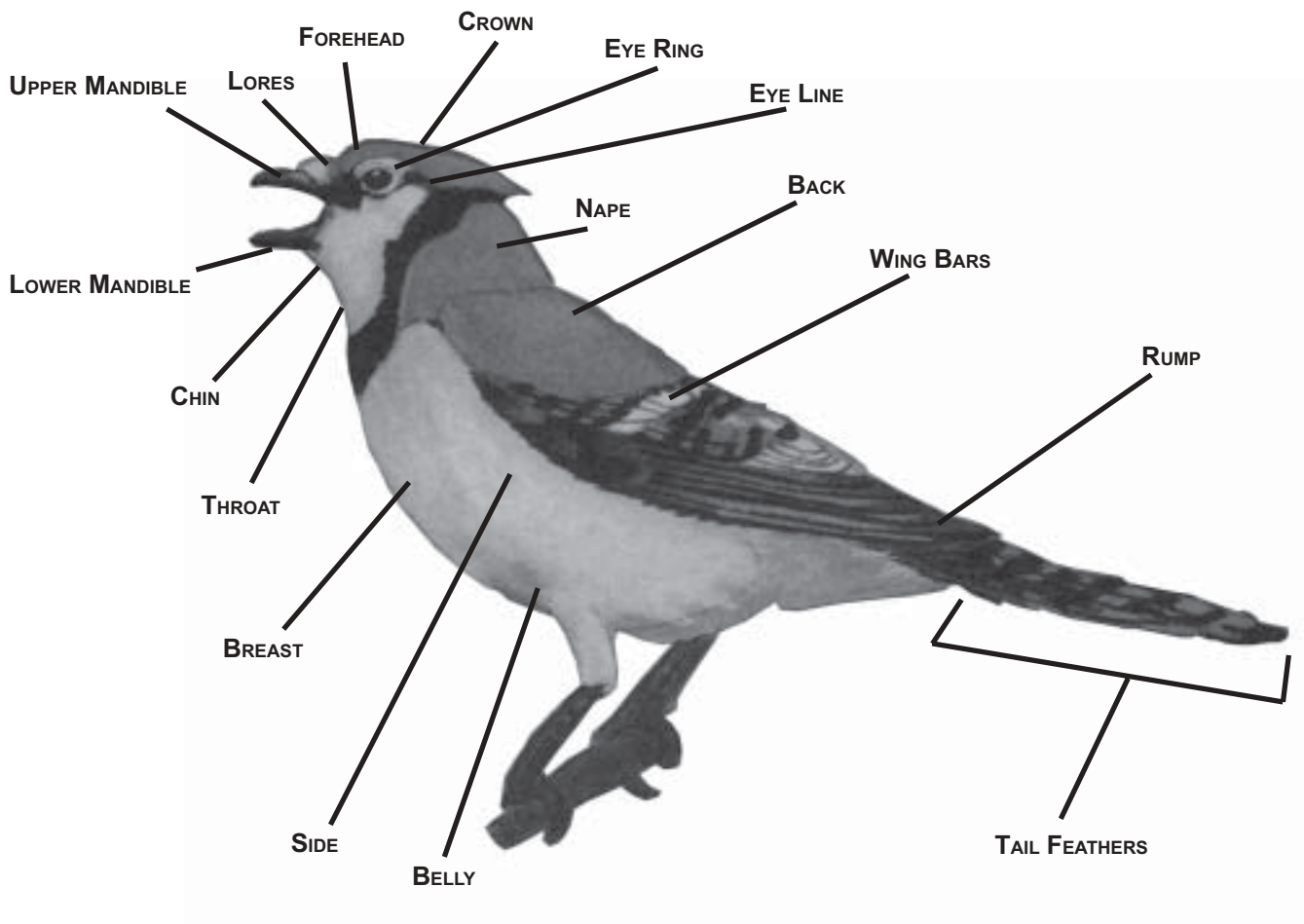
After you have done all three roles, work together to try to identify any of the birds you were not sure about. Create a list of all of the birds you identified. You will submit your notes and the final list to your teacher.

HOW TO IDENTIFY BIRDS:

There are certain characteristics about birds that can give you a positive identification. Make note of the body parts below when you are identifying the birds you see.

What is the bird's size?

Is it a larger bird? small bird? bigger than or smaller than birds that you definitely know?



Pisgah Marsh Herpetology

What is Herpetology?

Herpetology is the study of reptiles and amphibians (herps). This includes such animals as: frogs and toads, lizards, salamanders, snakes and turtles. About 90 species of reptiles and amphibians occur in Indiana.

Frogs and Toads	17 different species
Lizards	6
Salamanders	22
Snakes	36
Turtles	16



The Blandings turtle is a state-endangered species. Pisgah Marsh is home to the Blandings turtle and several other endangered species. Although not visible in this photo, Blandings turtles have a distinct yellow-colored throat.

Amphibian or Reptile?

All herps are considered to be **ectotherms**. Ectotherms maintain their body temperature by absorbing heat from the surrounding environment. They are often described as being **cold-blooded** and are unable to regulate their body temperature internally. This is why you may see turtles or snakes sitting in the sunshine.

Amphibians were the first vertebrates to adapt to life on land some 360 millions years ago and are a transition group between aquatic and strictly land vertebrates. They have soft, moist skin and thus, cannot stray far from water.

Amphibian eggs do not have a tough protective shell as do land vertebrates. Many also do not have fully developed lungs and still have gills to help them breathe in the water. The moist skin is also used to help the animal breathe.

Frogs, toads and salamanders are all amphibians.

Reptiles are considered the first truly terrestrial vertebrates. They show important advancements over their amphibian counterparts. They have shelled eggs that can be laid on land. They also have a tough protective skin that improves their fitness on land. Their blood circulation and breathing processes are more developed than that of amphibians and they breathe through lungs. Common reptiles in Indiana are snakes, turtles and lizards.

Pisgah Marsh is a very important area for amphibians and reptiles. It is also home to the state-endangered Eastern massasauga rattlesnake.



The state-endangered Massasauga rattlesnake calls Pisgah Marsh home. Tiger salamanders (below) are quite common in Indiana. They can also be found at Pisgah Marsh.



Key Terms

amphibian cold-blooded
ectotherm herpetology
reptile

Herpetology Quick Facts

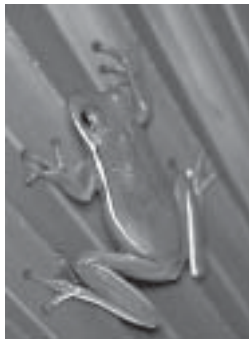
Frogs and Toads

Frogs and toads do not have teeth.

Frogs and toads shed their skin as they grow.

Frogs and toads have vertebrae but do not have ribs.

Only toads have warts. Despite myths, you cannot get warts from a toad. In fact, they really aren't even warts. They are actually bumpy glands.



(above left) Green frogs can sound like a plucked banjo string. (left) Eastern gray treefrogs have a flutelike trill. (above) Green treefrogs were discovered to be in southern Indiana in 2003.

Lizards

There are about 90 kinds of lizards in the United States.

Lizards usually have four legs. Others have two legs and some even have none!

Usually, lizards have five clawed-toes on each front foot. The toes on their back legs also have claws.

Most lizards can swim and some can run up to 15 miles per hour.

If a lizard's tail is broken off, it can grow a new one.

Salamanders

About 135 kinds of salamanders live in the United States.

Like lizards, most have four legs, others only have two and some don't have any at all.

A salamander's front foot only has four toes. Most have five toes on each hind foot. Salamanders do not have claws.

Salamanders can repair almost any injury to their body: they can regrow new tails, legs and feet.

Snakes

Snakes must shed their skin at least once a year so they can grow.

Snakes hibernate in cold weather and have no arms or legs.

Each side of a snake's lower jaw moves. This lets the snake eat food bigger than its mouth.

There are about 115 different kinds of snakes in the United States. Most are harmless and some are poisonous.

Most snakes squeeze their prey to death and swallow it whole. Poisonous snakes use venom to kill prey.

Turtles

A turtle's shell makes up as much as one third of the turtle's total weight.

To protect themselves from danger, some turtles can pull their head and legs inside their shells.

Some turtles will bite, hiss or scratch.

Most turtles like freshwater lakes, ponds and rivers. They are found on the land surrounding these and other wet places. Some turtles live in the ocean. Tortoises prefer to stay on dry land all the time.

Leatherback sea turtles are the largest of all living turtles. The record leatherback weighed 2,016 pounds!

Classroom Activity

Pisgah Frog and Toad Field Guide. This activity teaches students how to use a field guide to identify animal species in the field. Using the online Amphibian Research and Monitoring Initiative (ARMI) database, encyclopedias and other field guides as a sample, students will make their own field guide for the species found at Pisgah.



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Information provided by *Amphibians & Reptiles of Indiana*, Sherman A. Minton, Jr. (2001); *Take-Along Guide: Frogs, Toads and Turtles and Take-Along Guide: Snakes, Salamanders and Lizards*, Diane L. Burns. (1997). Photos: Eastern Gray Treefrog, R.A. Fridell. Green Treefrog, USFWS.

Pisgah Marsh Herpetology

Activity Sheet

Pisgah Frog and Toad Field Guide

OBJECTIVES:

Students will understand the following:

1. How to utilize a field guide to identify species in the field.
2. Utilize online databases and other available resources to obtain data, information and maps. Learn how computers have become invaluable tools in science.
3. Using tables and maps to help support written materials.

MATERIALS:

Access to reference materials on amphibians and reptiles.

Paper

Colored Pencils

Pencil

PROCEDURE:

1. Photocopy and distribute a page from a field guide and discuss with students how to use them and what information they can obtain from them.
2. Tell your students that they will do their own research on frog and toad species that might be found at Pisgah Marsh. Based on what they learn, they will make their own Amphibian field guide for Pisgah Marsh. A total of 12 species might be found at Pisgah Marsh. Students can be required to do research on all 12 of these species or just 6 of these species.
3. Using colored pencils, computers, the Internet, encyclopedias and other books, have the students make their own field guide.

ADAPTATIONS:

Adaptations for Older Students:

Have students create a field guide for all 17 Indiana-native frog and toad species.

Indiana's Native Frog and Toad Species. Species in bold might be found at Pisgah Marsh. Species considered endangered in Indiana are signified with an asterisk (*);

Common Name

American toad

Bullfrog

Chorus frog

Cope's gray treefrog

Chorus frog

*Crawfish frog

Cricket frog

Eastern gray treefrog

Scientific Name

Bufo americanus

Rana catesbiana

Pseudacris triseriata

Hyla chrysoscelis

Pseudacris triseriata

Rana areolata

Acris clamitans

Hyla versicolor

Common Name**Fowler's toad****Green frog**

Green treefrog

Northern leopard frog**Pickerel frog**

Plains leopard frog

Southern leopard frog

Spadefoot toad

Spring peeper**Wood frog****Scientific Name*****Bufo fowleri******Rana clamitans****Hyla cinerea****Rana pipiens******Rana palustris****Rana blairi**Rana sphenoccephala* or *Rana utricularia**Scaphiopus holbrookii****Pseudacris crucifer******Rana sylvatica*****DISCUSSION QUESTIONS:**

1. Discuss how field guides can benefit nature lovers
2. Discuss how scientists may not always agree on information. Did the students notice different information for each of the species depending on the source.
3. Discuss how helpful the Internet was in providing information and the concern for accuracy in using the Internet as a research tool.
4. Discuss what problems someone might encounter when using a field guide as a reference tool.

EVALUATION:

You can evaluate your students on the content in their field guides, sketches and data using the following three-point rubric:

Three points: maps and photos carefully and accurately drawn/displayed; paragraphs clear, complete, and error-free

Two points: maps and photos adequate; paragraphs sufficiently clear, but with some errors

One point: maps and photos adequate; paragraphs lacking in clarity with numerous errors

You can ask your students to contribute to the assessment rubric by determining what information the report should provide.

SAMPLE FIELD GUIDES:

Conant, Roger, and Joseph T. Collins. (1998). Peterson Field Guides: Reptiles and Amphibians. New York: Houghton Mifflin Company.

For more outdoor educational resources, please go to www.acornnaturalists.com

Pisgah Marsh Amphibian Field Guide

INTRODUCTION

When was the last time you saw a bird fly by or saw a frog in your front yard but did not quite know what it was? You are not alone! Nature lovers worldwide utilize field guides to help them identify the animals they see.

Field guides include important information about animals and characteristics that can be used to positively identify them. Some information you might find in a field guide is: common names, scientific names, photographs, a written description of the animal, maps of the animal's range, the type of habitat they live in or notes about the animal's behavior.

OBJECTIVE

With this exercise you will utilize Internet and library resources to create your own Frogs and Toads of Pisgah Marsh Field Guide. There are a total of twelve different species that could be found at Pisgah Marsh. Your teacher will indicate the total number of species you need to gather information on for your field guide.

Species at Pisgah Marsh

American toad	<i>Bufo americanus</i>
Bullfrog	<i>Rana catesbiana</i>
Chorus frog	<i>Pseudacris triseriata</i>
Cope's gray treefrog	<i>Hyla chrysoscelis</i>
Cricket frog	<i>Acris clamitans</i>
Eastern gray treefrog	<i>Hyla versicolor</i>
Fowler's toad	<i>Bufo fowleri</i>
Green frog	<i>Rana clamitans</i>
Northern leopard frog	<i>Rana pipiens</i>
Pickerel frog	<i>Rana palustris</i>
Spring peeper	<i>Pseudacris crucifer</i>
Wood frog	<i>Rana sylvatica</i>

DIRECTIONS

Using reference materials (field guides are not permitted), perform your own research and write a brief description for each of the following items:

1. Common name
2. Scientific name
3. Body length
4. Written description of what the species looks like and any key characteristics about the species.
5. Habitat
6. Voice or description of the animal's call
7. Range map
8. Additional information (may include interesting facts such as record sizes or odd behaviors.)

Request from your teacher a sample report of an animal from a field guide to use as an example.

FINDING RANGE MAPS AND PHOTOS

Because you will not be utilizing actual field guides to collect the information on the frog and toad species found at Pisgah Marsh, alternate resources must be utilized. The ARMI national atlas of amphibian distributions through the Amphibian Research and Monitoring Initiative will be used to obtain and maps. Color in the appropriate Indiana counties on the maps provided to you by your teacher. Make a state map for each species.

1. You must have Internet access.
2. Go to the ARMI atlas website at:
<http://www.mp2-pwrc.usgs.gov/armiatlas/>
3. Click on the "Browse Anuras" link to find the species found at Pisgah. You will need to have scientific names in order to navigate around this site.



Sample range map for the Fowler's Toad from the ARMI website.

4. Photos may be obtained by clicking on the "species photo" link, or by using photos on other websites. Make sure to provide appropriate photo credit for the photo.
5. Using the information you collect, put together your own field guide and design your own cover. Remember to be creative!



Pisgah Marsh Mammals



What are Mammals?

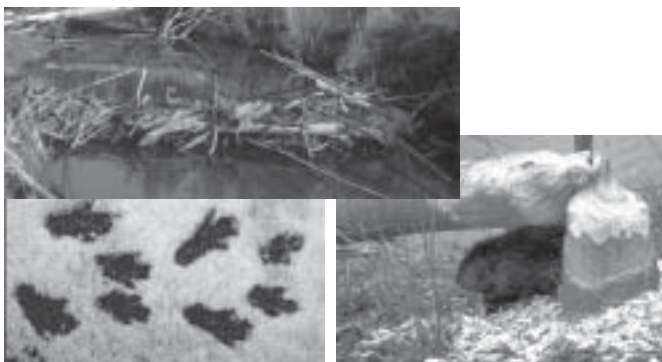
Mammals are the most biologically advanced animals on the planet. Key characteristics of mammals are:

1. have hair
2. eggs develop internally and give birth to live young
3. females have mammary glands that produce milk
4. have a muscular diaphragm
5. presence of a single bone in the lower jaw and three small bones in the inner ear
6. four-chambered heart

Sign Off: Mammal Behaviors

There are over 50 species of mammals found in Indiana. These range from mice, bats and rabbits, coyotes, foxes and bobcats to deer. Although you may not always see them, they often leave sign or other evidence behind: tracks, droppings, gnawings, scratchings, rubbings, dams or burrows.

The study of an animal's behavior while in a natural setting is called **ethology**. Biologists study behavior to better understand the health and status of animals, to better understand the role of social behaviors in sustaining life and to gain insight into human behavior.



It's Chow Time!

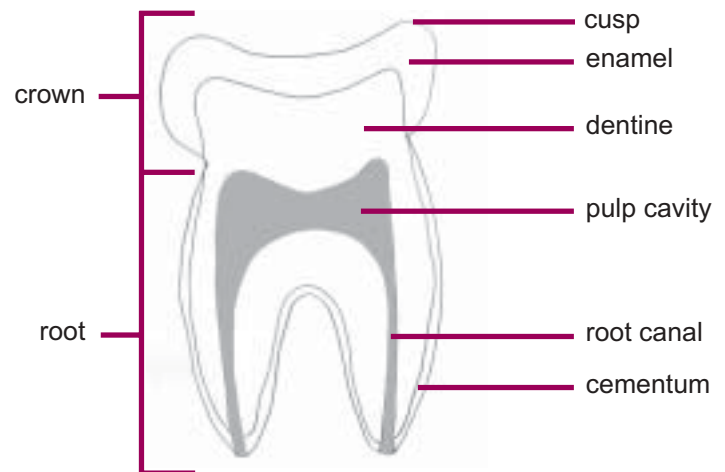
Mammal teeth are similar in basic parts. However, the number of teeth and their size and shape all vary greatly depending on what the animal eats. Most mammals are classified as **Carnivores**, **Herbivores**, **Insectivores**, or **Omnivores** (vampire bats are called sanguivores).

Carnivores feed on other animals (invertebrates other than insects and other vertebrates). Examples of carnivorous mammals in Indiana are eastern mole, badger and bobcat.

Herbivores feed on plants or parts of plants including roots, leaves, stems, seeds or fruit. Examples of herbivorous mammals in Indiana are, beaver, eastern cottontail and white-tailed deer.

Insectivores feed on insects. The completely-insectivorous mammals in Indiana are bats.

Omnivores feed on both plants and animals. Some omnivorous mammals in Indiana are eastern chipmunk, the gray squirrel, house mouse, coyote, raccoon and skunk.



Cross section of a mammalian tooth.

Key Terms

canines	cementum	crown
cusp	dentine	enamel
ethology	herbivore	incisors
insectivore	molars	omnivore
pulp	root	root canal

canine- long sharp tooth between the incisors and premolars often used to capture, hold and kill prey

cementum- a bonelike layer that covers the root

crown- the portion of a tooth exposed above the gumline

cuspl- a peak or rounded elevation on the crown of a tooth

dentine- bonelike material that makes up most of a tooth

enamel- a thin layer of hard, usually white, material that covers the crown.

incisors- generally chisel-shaped teeth, usually in the front, used for nipping

molars and premolars- found behind the canines, used most during the chewing process

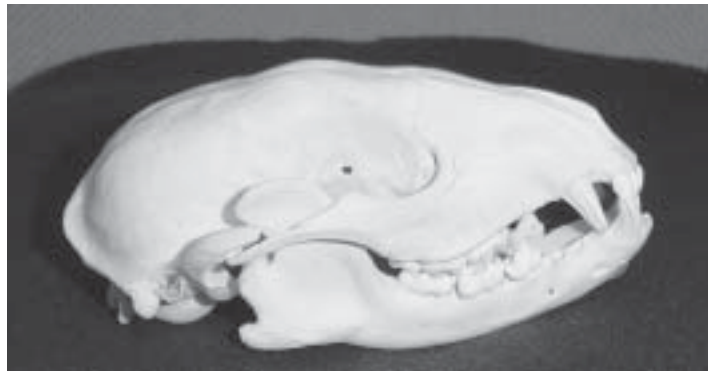
pulp- the central, living portion of a growing tooth.

root- the portion of a tooth that fits into the jaw

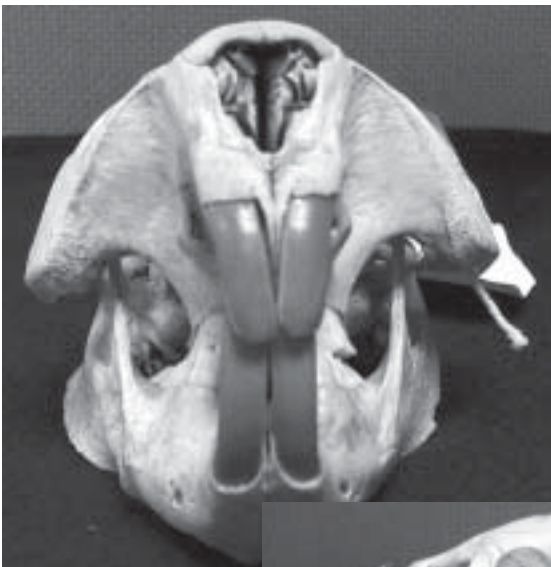
root canal- blood vessels and nerves pass through this opening in the tooth.



(Above) A coyote skull. Although coyotes are considered omnivores, their primary diet is made up of small rodents and rabbits. Notice the long canine teeth and the sharp back teeth, designed for shearing. The last upper premolar and first lower molar, called carnassials, work like scissor blades for shearing.



(Above and right) A raccoon skull. Although raccoons are also considered omnivores, their primary diet is made up of fruits, nuts, grains and insects. Notice the long canine teeth and the flatter back teeth.



A beaver skull. Beavers are herbivores. Notice the long, front teeth and the flat back teeth and the empty space between them. This space is called the diastema.

Classroom Activity

Learn how to monitor animal behavior. See the Recording Mammal Behavior activity sheet for instructions.



Wildlife Diversity Section
402 W. Washington St., W273
Indianapolis, IN 46204
317-232-4080
www.wildlife.IN.gov

Information provided by *A Manual of Mammalogy: with Keys to Families of the World, Second Edition* by DeBlase and Martin (1974); *Mammals of Indiana* by Mumford and Whitaker, Jr. (1982).

Recording Mammal Behavior

OBJECTIVES:

Students will understand the following:

1. Learn about what an Ethologist does.
2. Use tables, charts and graphs in making arguments and claims in fieldwork.
3. Find what percentage one number is of another and use this data to support claims.
4. Learn one method that scientists investigate natural phenomena and animal behavior.
5. Learn how to write clear, step-by-step procedural summary for the experiment.

MATERIALS:

Paper
Pencil
Mammal in natural setting to observe
Watch with a second hand, digital or stop watch
Activity Sheet

PROCEDURE:

1. Review with your students what they have learned about animal behavior and that certain behaviors are necessary to keep the animal alive.
2. Review with your students how to write a lab report using Introduction, Procedure, Results and Conclusion.
3. Tell your students that they will participate in an activity that will require them to observe a mammal of their choice (pet cat, pet dog, pet hamster, raccoon, squirrel, or farm animal--cow, pig, sheep) for a total of 20 minutes.
4. Using the handout, explain how to collect data for the experiment. This method of data collection is a systematic sampling method using focal scan sampling. The observer concentrates on just one individual and records whatever the individual is doing at set time intervals or the moment the animal is observed.
5. Explain to students how to determine what percentage of time was used during the 20 minutes for each behavior and how to draw a pie chart indicating their results. Determine the total percentage of time used for each behavior.

ADAPTATIONS:

Adaptations for Older Students:

Have students collect data for the same animal over several days. Ask a biologist or volunteer from your local zoo who studies animal behavior to speak to your class about how they collect data and what they use it for.

DISCUSSION QUESTIONS:

1. Discuss the importance of social interaction amongst mammals, including humans.
2. Speculate what the students' results might indicate about the animal's overall health.
3. Discuss how can this type of research be used to help manage wildlife and conserve endangered wildlife.
4. Discuss how animal behaviors might be an indication of problems within their environment or population.

EVALUATION:

How well the student was able to follow instruction on doing an experiment/lab write-up.

How well the student explained the study results and what this might indicate about the species.

Class participation with discussion.

Recording Mammal Behavior

Ethologists, biologists who study animal behavior, use different methods to collect data about animal behaviors. In this exercise you will collect data and put your observations in table format, also called systematic sampling. You will focus on just one animal, this is considered focal sampling.

This exercise also uses *scan sampling*. Scan sampling requires you to observe an animal at set time intervals, and whatever the animal is doing at that moment in time is recorded on your data sheet.

You will need: a pencil; paper; this worksheet; a watch with a second hand, digital or a stop watch

DIRECTIONS:

A. Select a mammal of your choice that you can observe. This can be a pet such as: cat, dog or hamster; barnyard animal such as cow, horse, or pig; or wild animal such as: deer, raccoon or squirrel.

B. Locate a place where you can observe the animal without being noticed or without impacting how the animal behaves.

C. Read through and understand the different animal behaviors on the back of this sheet.

D. Record the date, time and animal being observed on the data sheet.

E. When you are ready to begin, record the time on your data sheet and look at the animal. Mark with a checkmark or X in the appropriate box what the animal is doing when you look at it.

F. Tracking your time, wait exactly one minute from the initial time you wrote down. Record the time on your data sheet and record again, what the animal is doing at that point in time only.

Continue to do this every minute for 20 minutes.

G. When you are finished collecting all of your data, count of each marked box for each behavior and write this number on the appropriate line. Your total should equal 20.

H. Determining percents:

To determine what percentage of time was taken up by each behavior you will need to do a little math.

$$F = \frac{N}{T}$$

$$P = F \times 100$$

F= fraction of total time

N= number of times behavior was recorded

P= percent of total time dedicated to that behavior

T= total amount of times data was recorded

Let's determine the percent for the sample data below for each behavior.

Alert/resting: 1
Grooming: 2
Sleeping: 1
Total: 4

N
T

Determine Percentage for Alert/Resting:

$$F = \frac{1}{4} \quad P = .25 \times 100$$

$$F = .25 \quad P = 25\%$$

Determine Percentage for Grooming:

$$F = \frac{2}{4} \quad P = .50 \times 100$$

$$F = .50 \quad P = 50\%$$

Determine Percentage for Sleeping:

$$F = \frac{1}{4} \quad P = .25 \times 100$$

$$F = .25 \quad P = 25\%$$

If you add up your final percentages, the total should equal 100.

$$25 + 25 + 50 = 100$$

I. Create a pie chart showing how much time is taken up by each behavior.

J. Following teacher instructions, complete a laboratory book write-up. Your write-up should have: an Introduction explaining the experiment; Procedure explaining how you did the experiment; Results showing the data you collected (your data sheet); and Conclusion explaining the results you found and hypothesize about what these results mean (final percents and pie chart).

Behaviors	2:15	2:16	2:17	2:18
Alert/resting: animal is awake	X			
Courtship Behavior: mating or other premating behavior				
Defending: growling, scratching, attacking				
Excreting: going to the bathroom, using the litterbox				
Grooming: licking fur, rubbing ears, licking feet, biting at fleas		X	X	
Ingesting: eating or drinking				
Movement: walking, running, climbing				
Playing				
Sleeping:				X
Vocalizing: bark, moo, hiss, purr				
Other				

Sample data on record sheet.

Date: _____ Animal Observed: _____ Name: _____

Start Time: _____ End Time: _____

Behaviors	Time Interval											
Alert/resting: animal is awake												
Courtship Behavior: mating or other premating behavior												
Defending: growling, scratching, attacking												
Excreting: going to the bathroom, using the litterbox												
Grooming: licking fur, rubbing ears, licking feet, biting at fleas												
Injesting: eating or drinking												
Movement: walking, running, climbing												
Playing												
Sleeping:												
Vocalizing: bark, moo, hiss, purr												
Other												

<u>Totals</u>		<u>Percents</u>	
Alert/resting=	_____	Alert/resting=	_____
Courtship Behavior=	_____	Courtship Behavior=	_____
Defending=	_____	Defending=	_____
Excreting=	_____	Excreting=	_____
Grooming=	_____	Grooming=	_____
Injesting=	_____	Injesting=	_____
Movement=	_____	Movement=	_____
Playing=	_____	Playing=	_____
Sleeping=	_____	Sleeping=	_____
Vocalizing=	_____	Vocalizing=	_____
Other=	_____	Other=	_____